



Course 204. Cooking and Camping with the Crew

For students aiming to help pull off multi-day trips in the backcountry or frontcountry. Whether your group will be large or small, this course provides helpful tips on nutrition, food planning, and shopping, setting up a field kitchen, what to bring, and tips for cooking with trail crews. It also covers best practices for food storage and sanitation at camp. No prior experience is necessary, although familiarity with typical work parties and basic kitchen equipment will be helpful.

STUDENT SKILL OUTCOMES:

- Understanding of crew nutrition needs
- Menu planning based on crew preferences, environment, and pack animal capacity
- Familiarity with camp and kitchen equipment and how to pack it
- Safe storage, sanitation, and food service practices
- Leave No Trace in the kitchen and camp

KEY TERMS:

hand-washing station, Leave No Trace (LNT), bear boxes, bear hang, dutch oven, GORP

Hand-washing Station: A dedicated mechanism for washing hands with soap and water in basecamp.

Leave No Trace (LNT): Ethics overarching everything trail crews do on the trail and in camp. Leave No Trace is built on seven core principles that are used to communicate the best available minimum impact guidance for enjoying the outdoors responsibly. The Seven Principles of Leave No Trace were developed to help educate and guide recreationists in sustainable minimum impact practices that mitigate or avoid recreation-related impacts. These Principles are the most robust and widely utilized minimum impact outdoor practices. Although Leave No Trace has its roots in backcountry and wilderness, the practices have been adapted so that they can be applied anywhere - from the backcountry, to local parks, to your backyard - and for any recreational activity. Each Principle covers a specific topic and provides detailed information for minimizing impacts.

The Seven LNT Principles:

- Plan Ahead and Prepare
- Travel and Camp on Durable Surfaces

- Dispose of Waste Properly
- Leave What You Find
- Minimize Campfire Impacts
- Respect Wildlife
- Be Considerate of Other Visitors

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Bear Boxes: metal or thick plastic resin containers with bear-resistant closures, often designed as panniers for pack stock

Bear Hang: a method of suspending food off of the ground, to make it more difficult for a bear to obtain the food

Dutch Oven: a thick-walled (usually cast iron) cooking pot with a tight fitting lid

GORP: Traditionally this stands for “Good Old Raisins and Peanuts”, but it has come to represent just about any type of trail mix.

TRAIL MAXIMS:

“A well-fed crew is a happy crew”, “Mealtime is about more than just the food ... but the food is really important”, “The way one eats is the way one works,” “Pack it in, Pack it out”

HANDOUTS:

- Backcountry Nutrition Myths & Facts (quiz & answer key)
- Serving Size Guide
- Food Survey
- Menu Plan
- Trail Crew Chore Chart
- Recipes for Trail Crews

TOOLS NEEDED (PER 8 STUDENTS):

backpacking stove, multiple burner stove, rope/

parachute cord, horse panniers/bear boxes, food bags, lidded buckets, carabiners, coolers, kitchen cache, ingredients for a recipe to demonstrate

WORK SITE REQUIREMENTS:

This course can be in any comfortable “classroom” setting. However, a level outside surface will be helpful in setting up a sample camp and kitchen, and some trees are necessary for bear hang practice.

KEY CONCEPTS:

- 1) Importance of Food
 - Physiology and morale
- 2) Menu Design
 - Meal planning factors
 - Ensuring nutrition
 - Meal ideas
- 3) Making a Shopping List
 - Portion sizes
 - Purchasing
- 4) What to Pack and How to Pack
 - Typical kitchen gear
 - Packing for a stock-supported trip
 - Labeling your containers
- 5) Best Practices at Camp
 - Camp location and layout

- Daily routines
 - Delegating
 - Typical chores
 - Latrine protocol
 - Hand-washing practices
 - Water
 - Treating water
 - Estimating water needs
 - Stoves
 - Types
 - Estimating fuel needs
 - Fires
 - LNT fires
 - Baking using Dutch Ovens
 - Food Safety and Storage
 - Food safety
 - Refrigeration options
 - Critter proofing
 - Special considerations for bear country
 - Washing Dishes
 - Using a four-bin washing system
 - What to do with wastewater
 - Managing garbage
- 6) Wrap Up
 - Break down camp
 - Reporting and paperwork

IMPORTANCE OF FOOD

Have you ever noticed how food is often the center of trail conversation, especially on a multi-day project? There's a good reason why trail volunteers are preoccupied with food, and why food is one of the most important components of a trail crew experience. Trail workers expend energy and burn calories at a rapid rate, up to two or three times faster than they would typically burn calories off-trail. While it may be the case that this caloric necessity can transform any type of food into something exquisite, we owe it to our volunteers to provide the best. There are many important considerations, and many tried and true techniques to be mastered for providing nutritious food safely and efficiently in the backcountry.

Beyond the physical needs for calories and water, food also plays a role in mental and emotional well-being. Low blood sugar can lead to low energy levels, depleted coordination and inability to think clearly. These factors can greatly affect group dynamics, not to mention safe handling of tools. A bag of chocolate that materializes from nowhere on a chilly, damp backcountry afternoon can do wonders for the morale of a dispirited group. A well-fed crew is a happy crew.

Meals are also central to the group's sense of community. Group bonding and development happens during meal time, by providing an opportunity for everyone to sit together and share experiences from the day, or from their lives. The finest trail crews never skimp on food or mealtime experiences. Mealtime is about more than just the food ... but the food is really important.

MENU PLANNING & FOOD PURCHASING

Some level of advance meal planning is necessary whether your group is small or large. Don't be

tempted to escape planning by merely “stocking a pantry” full of common ingredients, and declaring a “free for all.” This makes people uneasy and leads to shortages of certain items and a wasteful surplus of others.

One option popular for backcountry trips without pack animal support is a buddy system coordinated before the outing. Small cook groups of two or three people each plan on sharing a lightweight stove, pots, and meal plans among themselves. Each group can decide whether to cook using favorite recipes or to go with packaged meals that only require boiling water. This system works best when participants already know each other.

In most cases where participants don’t know each other yet, and/or one person’s doing all the shopping, advance design of the whole trip’s menu will result in the most successful kitchen. Some crews specifically recruit a dedicated cook to take charge of the menu and cooking and to tend basecamp while others are on-trail. On other crews, a crew leader does the menu and shopping, but then once at camp, everyone pitches in equally to cook and clean.

Meal Planning: (adapted from *NOLS Backcountry Cooking*)

- Step 1: Determine the number of meals you will need for the duration of your trip
- Step 2: Decide specifically what you will eat at each of your meals
- Step 3: Estimate how much food you will need to feed all trip participants
- Step 4: Determine total weight/amounts of food needed for menu; make shopping list
- Step 5: Go Shopping
- Step 6: Repackage, prep and pack food

Factors Influencing Meal Planning:

- Difficulty of the hike and the work. More strenuous trips usually need more food.
- Weather: When it’s cold, more calories are used. Especially if it’s wet and cold, plan for more soups and hot drinks. Consider thermoses for bringing hot cocoa and coffee out to the worksite.
- Appetites: Generally speaking, a group of young adults is going to eat more than a group of retirees. But if you have the opportunity, it’s best to ask folks before you do the shopping. There’s an appetite question on PCTA’s Volunteer Application.
- Preferences and Dietary Restrictions/Allergies: PCTA’s Volunteer Application asks about dietary needs. Make sure everyone in your group has filled one out, and then, ask the Volunteer Programs Assistant to send you the profiles. Some cooks go even further and send out a detailed participant Food Survey (see handout). Inevitably, each crew will have different food wants and needs. An easy solution to varied eaters is to plan meals that can easily be altered. For example, a pasta dish may have a meat sauce and a veggie sauce with cheese on the side. Common dietary restrictions include vegetarian, vegan, gluten-free, dairy-free, nut allergy, low-glycemic, etc. A plethora of resources are available to learn what these terms mean, and when in doubt, ask! Most items to accommodate these needs are available in any major grocery store.
- Nutrition: While cookies, chips, and bacon might be very welcomed by the crew, it’s important cover all the food groups. More about nutrition in the next section.
- Complexity and Prep Time: Some meals are simpler to make (and to clean up), potentially freeing the crew for more on-trail time. On the other hand, if you’re planning to have a dedicated cook and/or plenty of basecamp time, it’s a real pleasure to have meals made from scratch.
- Altitude affects the boiling point of water. Therefore, you can’t prepare dried beans above 5,000 feet unless you have a pressure cooker because they’ll never get soft enough. Also, pasta cooked above 10,000 feet often turns to glop before it cooks because the water does not boil hot enough.
- Weight and Space: Especially when food is to be carried into the backcountry by backpack or pack stock, you’ll need to choose foods that are lightweight and compact. Changing and removing packaging makes a big difference. More on this in the “How to Pack” section.
- Packability: Some foods hold up better than others against accidental smashing. Apples are better than bananas. Tortillas are better than sliced bread.
- Spoilage: It’s best not to plan on lots of food that needs refrigeration. Often, meals that use perishable items should be cooked in the first few days. More tips about refrigeration are in the Food Storage section below.

- **Fuel:** Your fuel is probably not unlimited, so, plan on foods that won't hog the stove for hours.
- **Budget:** Your food choices will be influenced by the expense and availability of various fresh, frozen, and dried foods. Generally speaking, it's possible to feed a crew quite well on a budget of \$8-12 per person per day. Each area has its own stores where bargains can be found on natural, organic, bulk, and specialty foods.

Ensuring Nutrition: Carbohydrates are important for high levels of physical activity. Bear in mind that complex carbohydrates (whole grain breads and pastas, brown rice, barley, quinoa, beans, lentils, vegetables) burn longer and better than simple carbohydrates (white bread, white rice, conventional pastas, most packaged cereals, cookies, candy). You don't want your crew members to burn out too fast on what you are feeding them. The way one eats is the way one works.

When meal planning, keep in mind that variety is the spice of life. Nobody wants to eat mac and cheese five nights in a row, nor is it healthy to eat too much of any one thing. Try to achieve a good balance of all the food groups. It can be especially challenging to bring enough fruits and vegetables. Always try to bring some fresh, but, also plan on dried fruits as snacks, and dried vegetables in many recipes. Begin with fresh ingredients and cook from scratch as much as possible, while avoiding highly processed foods. Generally speaking, the more processed and packaged something is, the less nutritious it is.

As insurance, in case you have really big eaters or an unanticipated food allergy, it's good to keep a few extra items around. Extra mac and cheese boxes, mashed potato flakes, energy bars, or desserts will usually do the trick.

Meal Ideas: Following are some tried and true backcountry meal ideas. See the sample menu plan on the next page, then use the Menu Plan template and Recipes for Trail Crews (handouts) to help you complete your own menu plan.

Breakfast:

Cold Cereal	Oatmeal	Eggs (consider Egg Beaters)
Breakfast Burritos	Hash Browns	French Toast
Bagels	Biscuits and Gravy	Yogurt
Bacon/Sausage/Ham	Fruit Salad	Coffee/Tea
Milk		

Lunch and snacks for on the trail:

Lunch Meat	Tuna/Salmon Packets	Salami
Cheese	Bread/Tortilla	Last Night's Leftovers
Pasta Salad	Peanut Butter and Jelly	Hummus
Chips/Pretzels/Crackers	Beef Jerky	Fruit
GORP/Trail Mix	Carrots	Granola/Energy Bars

After work appetizers:

Lemonade/Iced Tea	Chips and Salsa/Hummus	Veggies and Dip
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Dinner:

Spaghetti and Meatballs	Pesto Pasta	Tuna Mac and Cheese
Mushroom/Beef Stroganoff	Veggie and Chickpea Curry	Veggies with Peanut Sauce
Shrimp and Grits	Falafel	Jambalaya
Burgers/Veggie Burgers	Brats/Italian Sausages	Burritos/Taco Salad
Tamale Pie	Lasagna	Mashed Potatoes
Cornbread	Chili	Soup/Chowder
Green Salad	Steamed Collards/Kale	Freeze-dried Meals

Dessert:

Cookies	Cakes/Brownies	Pies
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Pacific Crest Trail Association
Sample Menu Plan
 (Adapted from Appalachian Mountain Club)

Crew/Dates: _____
 Crew Leaders: _____
 Allergies/Food Dislikes: Vegetarian x3
 # of Participants: 11-12

	Breakfast	Lunch	Dinner	Dessert
Sunday			Stir-Fry 1 summer squash 6 cups brown rice 2 yellow onion 1 head broccoli 4 carrots 1 green pepper Curry powder, salt, pepper and soy sauce	1lb red licorice 1/2lb black licorice
Monday	Bagels 18 bagels 12oz peanut butter	Hummus Wraps 25 tortillas 8oz hummus 2 cucumbers 2 carrots 8oz dried plumbs 12 snack bars 1 bell pepper 1lb sandwich meat 1pk veggie sliced meat	Shepherd's Pie dehydrated milk 4 cups instant mash taters 2 can peas 2 onions 2 pks veggie sausage 3 carrots 2 cans lentils	Oreos
Tuesday	Oatmeal 11 cups oatmeal 8oz raisins 8oz brown sugar cinnamon	PB & J 40oz peanut butter jelly 30 tortillas GORP fig newtons 12 apples	Mac & Cheese 64oz mac & cheese mix 3 bricks tempeh 1 package cream cheese 5 carrots 1 stick butter	cheesecake 2pks instant mix dehydrated milk 1 stick butter
Wednesday	Cereal 1.5 boxes granola 1.5 boxes grape nuts 1qt dehydrated milk 8oz dried fruit	Pita & Sausage 1lb salami 1pk veggie sliced meat 2lbs cheese 30 pitas 1 cucumber 1/4 head green cabbage GORP 6oz ranch dressing	Tamale Pie 4 bricks polenta 3 cans whole pinto 2 cans refried beans 2 yellow onions cumin & hot sauce 2 bell pepper 16oz salsa 2lbs cheddar cheese 3 taco seasoning pack	choc chip cookies
Thursday	Oatmeal 11 cups oatmeal 8oz raisins 8oz brown sugar cinnamon	PB & J 40oz peanut butter jelly 30 tortillas GORP fig newtons 12 apples	Red Pasta 4lbs angel hair 8 veggie burger patties oil 64oz red sauce Parmesan cheese 1 can white beans	candy fest 3 boxes assorted candy
Friday	Pancakes 1 box bisquick 1.5qts dehydrated milk leftover dried fruit			

**1 GORP = 16oz Raisins
 16oz Peanuts
 16oz M&Ms
 16oz PB Pretzels**

Extras:
 Lemonade
 Salt and pepper
 Tang
 Instant coffee
 Tea (hot and iced)
 Oil
 Mustard
 Cumin
 Hot sauce
 Soy sauce
 3 sticks butter

Making a Shopping List: Consider purchasing in bulk if you are planning for several crew trips in one season. Otherwise, use the quantities listed in your recipes to make your shopping list. Portion sizes can be estimated based on what an average trail worker will eat, see “Serving Size Guide” handout. Bump the quantities up if you have a lot of big eaters and/or young people on your crew.

WHAT TO PACK & HOW TO PACK

A well-stocked kitchen and basecamp is the key to success. While each member of a group can be responsible for their personal eating utensils and dishes, a group kitchen must include items to prepare and serve food easily.

Typical Group Kitchen and Basecamp Gear: (adapted from *Lightly on the Land*)

Basic Gear:

Big tarp or shelter	Nylon cord	Flagging tape
Lanterns	Stove(s)	Fuel
Coolers	Bear boxes/hang apparatus	Bucket(s) for storage
Water jugs	Cutting boards	Recipes
Matches/lighters	Hot pads	Dish towels
Plastic bags	Water purification method	
Sandwich-sized, sealable, plastic containers for lunches and leftovers		

Pots/Pans:

Large skillet	Large stock pot(s) with lid	Dutch oven/pot with lid
Percolator/French Press/Pour over coffee cone		

Mixing Serving Utensils:

Mixing bowls	Measuring cups & spoons	Rubber spatula/scrapper
Pancake-turner	Slotted spoon	Wooden spoon
Tongs	Ladle	Sharp knives with sheaths
Cheese grater	Baking/bread pans	Can opener
Extra eating utensils		

Washing & Disposal:

Hand-washing apparatus	4 dish tubs	Sponges & scouring pads
Dish soap (biodegradable)	Bleach	Mesh straining screen
Garbage bags	Dish hammock/net bag	Paper towels
Toilet paper in ziplock with hand sanitizer		

Packing for a Stock Supported Trip: Please refer to PCTA's *Course 306: Working with Packers and Packstock* for a full lesson on this topic. For the purposes of the present course, here are a few pointers:

Packing food and kitchen supplies for a trip that is pack stock supported requires planning and effort. Find out how many stock will be available and whether your packer has any specific limitations. Horses and mules typically can carry about 150 pounds, divided evenly into pairs of 75 pound loads. Crews should always plan on carrying at least their first two meals in their own back packs, in case of a mishap with the packer.

The best packing containers can double as storage containers at camp; for example, **bear box** panniers or lidded buckets.

All food must be repackaged. Remove glass, cardboard, and excess packaging, which only adds weight and garbage. Just think about all the jostling that happens to loads on pack animals. Protect

eggs. Store liquids in leak-proof containers. Remember no glass! If you have smashables such as bags of chips or sliced bread, consider carrying them separately, maybe even on top of your backpack.

Pare down your kitchen gear to the lightest stuff. Unless your packer has a plethora of animals available, you might need to leave your cast iron cookware at home, and save it for car camping trips. Ensure pots and their lids, dishes, and utensils are taped together, padded, or otherwise stored in a manner that eliminates rattling. It may be simpler to pack a pair of 2.5 gallon propane tanks as opposed to a single five gallon because the latter is bulky and awkward for a pack animal.

Once containers are roughly packed, they must be weighed, readjusted, and weighed again until you have pairs of even loads. Mark each container with its weight. Keep the weight of regularly used items, such as roll-up tables, taped or permanently marked on to that piece of equipment.

Labeling: Labeling coolers, buckets, and bear boxes will help tremendously when searching for items. A piece of duct tape marked “breakfast” or “dry storage” will help keep order. Many leaders also find it useful to separate dinners into separate sacks. For example, a plastic grocery bag labeled “Tuna Mac and Cheese Dinner: Tuesday” contains all the ingredients needed for that meal, plus the written recipe, and it’s sealed with a knot. That way, Tuesday night’s volunteers can easily find what they are looking for, and, you don’t run the risk that someone accidentally eats the tuna for lunch.

Make it easier on the people assigned to meal duty by affixing lists to the food containers. One crew affixes a note saying:

Until we run out this is what we have:

Breakfast: muffins, cereal, oatmeal, fruit salad, bananas, bagels, coffee, juice, milk. Eggs are always available, but you have to cook and clean up after yourself.

Lunch: sliced ham, turkey, salami, 4 kinds of sliced cheese, peanut butter, 2 kinds of jelly, beef jerky, dried fruit, peanut M&Ms, granola bars, cookies, pretzels, apples, 4 kinds of nuts, bagels, cream cheese, hard boiled eggs, and last night’s leftovers.

Drinks: lemonade, instant iced tea, coffee, milk, orange juice, tea bags, hot chocolate

Appetizers: salsa, chips, guacamole, cheese, crackers, salami, broccoli, carrots, dip, potato chips, pretzels

Dinners are separated into their own labeled plastic grocery sacks: tuna mac and cheese, burgers, and burritos.

BEST PRACTICES AT CAMP

Camp Location and Layout: To practice Leave No Trace, a kitchen should be established in an area with durable surfaces -- often an already impacted area. Kitchen and camp should be at least 200 feet (80 steps) away from any water source or highly sensitive area. When possible, group camps should be located out of sight of trails or popular areas. This ensures the safety of the camp and also respects the wilderness experience of other visitors.

The kitchen should be at least 100 feet (40 steps) from the sleeping area. In bear country, food should be hung/stored at least 200 feet (80 steps) away from both the kitchen and the sleeping area. See below for more about precautions in bear country.

When you first arrive at camp, it’s a good idea to set up a few essentials right away. For example, send two people with a shovel, flagging tape, and instructions on how to dig a latrine. Send others to set up the hand washing station and sump. Remaining folks can be setting up the kitchen tent/tarp.

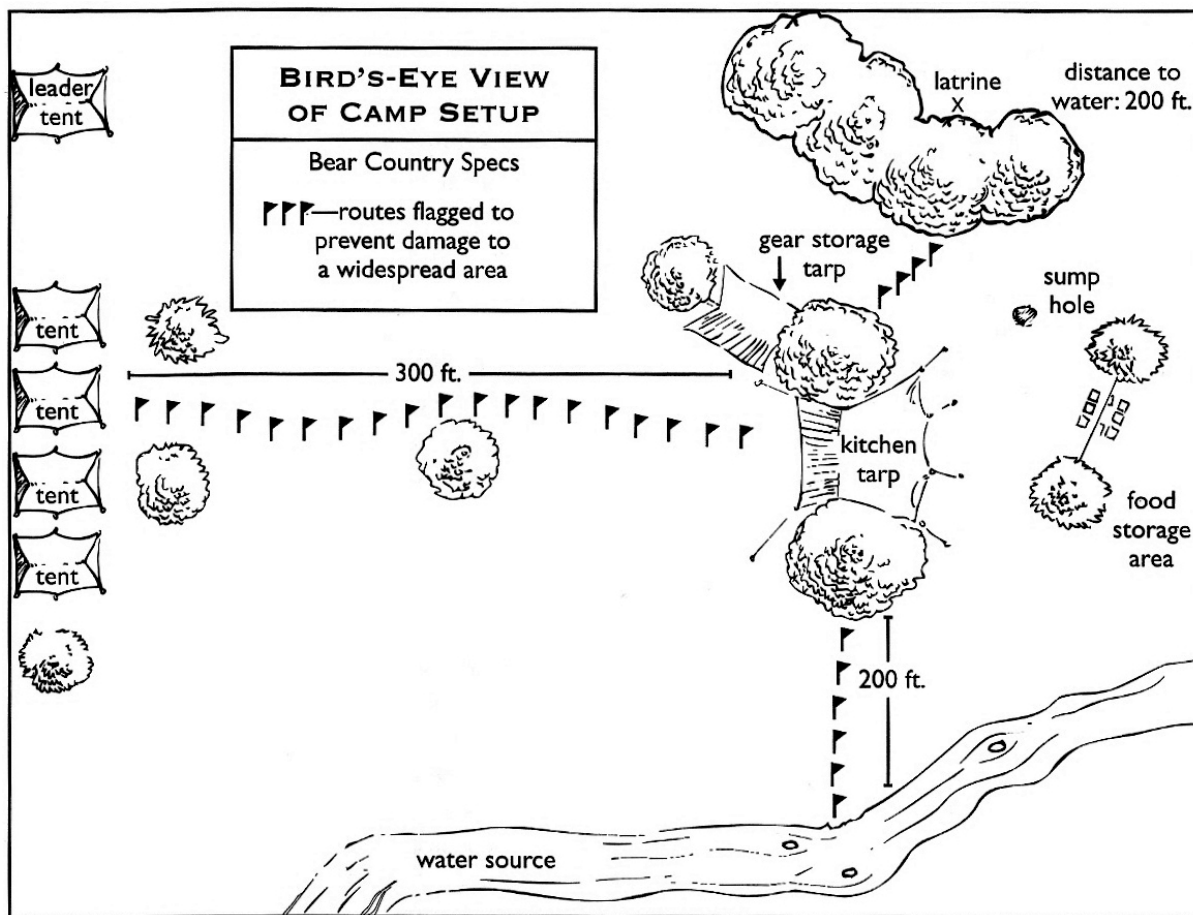


Figure 1. Careful location and layout decisions can minimize the environmental impact and maximize the comfort and safety of a crew. Note the illustration is not to scale.
(IMAGE FROM LIGHTLY ON THE LAND.)

Daily Routines: Make new people feel at ease upon arrival with a quick orientation explaining a few key basecamp practices and routines. For example:

"Typically, 4-5 p.m. is free time at camp. Everyone will get to take turns cooking and cleaning. You are responsible for your own dish and eating utensils. Latrine is occupied if the toilet paper container, this orange-painted can, is missing from this stump right here."

Don't feel like you have to cover everything at this initial orientation. Later on, perhaps when prep begins for the first meal, you can start going over more nitty gritty rules, such as:

"Only cooks in the kitchen while cooks are at work, no open-toed shoes in the kitchen, no touching anything in the kitchen without washing hands first."

In basecamp, just like at the worksite, part of the fun is about everyone pitching in. All crew members should expect to participate in cooking and/or cleanup, and other chores. Most crews will choose to establish some kind of rotation. While some groups may choose instead to rely on spontaneous volunteering, this method can have its disadvantages, especially with new volunteers. People are often more comfortable knowing in advance they can expect to cook on Tuesday, clean on Wednesday, fetch water on Thursday, etc. That way, they can feel free to sit by the lake and read a book if it's not their turn, rather than hovering about the kitchen with the vague concern that maybe they should be helping. Rather than pre-filling the chore chart with people's names, pass a clipboard around at orientation and get sign-ups. Use the Trail Crew Chore Chart template to help you with this.

You can, of course, customize the order of responsibilities to fit your group. One crew says:

"We used to have the crew make their lunches during breakfast in the morning, but after a while, we decided it seemed too hectic. Instead, we started having folks make their lunch during

dinner clean up. Everyone liked this better as breakfast was less chaotic so we could get on the trail sooner. It also encourages folks to take dinner leftovers in their sealable, plastic sandwich container for lunch the next day."

Latrine Protocol (adapted from *Leave No Trace in the Outdoors*): When group camping for many nights in the same site, it may be best to dig a latrine. Situate the latrine as you would a cat-hole, 200 feet (80 steps) from water, campsites, and trails. Ensure that the route to the latrine traverses durable surfaces. Some groups like to indicate the route with flagging tape.

Like a cat-hole, it should be eight inches deep and one shovel width wide, but unlike a cat-hole, it's a trench long enough to accommodate the needs of your party. If you have an especially large party or a long trip, you might choose to dig a deeper trench. Be aware this will slow decomposition time because it puts the waste into a zone of soil that's less biologically active.

Leave the clean dirt that you've excavated nearby, for adding after each deposit. When available, also sprinkle organic soil and surface litter. You don't need much – just a couple of handfuls. It's best not to leave a shovel at the latrine -- people will end up handling it with unwashed hands. Bury the toilet paper or pack it out. Naturalize the site and remove flagging as part of breaking camp.

Hand-Washing Practices (adapted from *Leave No Trace in the Outdoors*): Research suggests more people get Giardia from their camp-mates than from contaminated water. Frequent hand washing with soap has been shown to be the most effective practice for reducing illnesses in outdoor settings. Hand sanitizing gels can be substituted in a pinch, but these are less satisfactory when hands are dirty.

Crew leaders need to set a good example by letting the crew see them wash their hands--often.

Best practice for basecamp is to set up a station dedicated to hand-washing, always accessible for people to use whether they are returning from the latrine, from the trail, or getting ready to make dinner. This station should be at least 100 feet (40 steps) away from water sources. Use small amounts of unscented phosphate-free biodegradable soap.

Here are two examples of hand washing stations:

- Duct tape some p-cord to a squeeze bottle of biodegradable soap, or, throw a bar of soap in a mesh bag. Hang it next to a hanging water bladder with a simple valve, such as an MSR-brand Dromedary bag. You can make a rock-filled hole underneath to catch the soapy residue.
- Another system employs a foot pump to send clean water from one bucket to a spigot that's mounted to another bucket.

For washing hair or bodies, you can use a sun shower or the same kind of system you use for handwashing. Just make sure you are at least 100 feet from water sources. Never use soap in the water source, even the biodegradable kind.

Where fresh water is scarce, think twice before swimming in small creeks or ponds. Lotion, sunscreen, insect repellent, and body oils can contaminate these vital water sources.

Water: Many parasites, bacteria, and other contaminants can be found in backcountry water sources. Giardia is one of the most common microorganisms to be found in water sources and can cause a

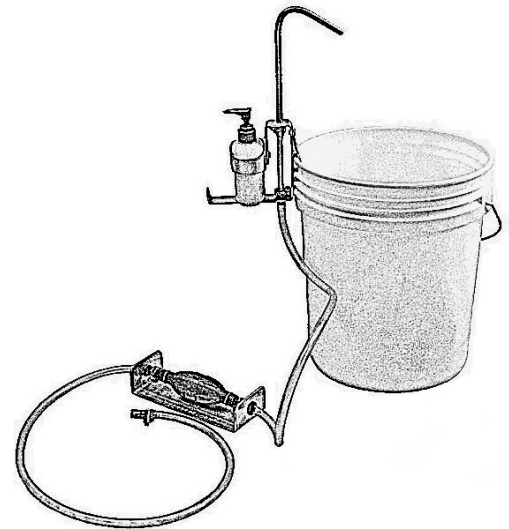


Figure 2. Online you can find this type of hand washing unit for sale pre-assembled or easy instructions to make one from simple components available at a hardware store. (IMAGE FROM TYE WORKS.)

myriad of health issues including vomiting, nausea, loss of fluids, etc. No matter how “pristine” the water source, treating drinking water is always a prudent choice. It is not necessary to treat dish water.

Careful water treatment is important, but remember, more people get intestinal bugs from their camp-mates than from contaminated water. So, hand-washing and food safety are just as important. See more tips under Food Safety.

There are several options for water treatment:

- **Boiling:** While this may impact fuel consumption, it is an old standby for water treatment. Most pathogens will be killed off at 140 degrees, but, just to make sure, especially at high elevation where boiling point is lower, it is recommended to boiling water for five minutes.
- **Filtration:** Hand-held pumps or gravity filter bags can be used to treat water for most contaminants, leaving no aftertaste. Gravity filters are great for larger groups. There are numerous products on the market. Filters can become clogged quickly, so regular cleanings and replacement cartridges are incredibly important. Fill gravity bags by dipping a cup or pan into the water source then pour into bag. Consider pouring through a clean bandanna for pre-filtration. Some crews along the PCT have developed a home-made filtration system utilizing filter cartridges designed for use in RVs. These tend to offer a higher output flow, a plus for larger groups.
- **Chemical Treatment:** Iodine and chlorine based products such as Aqua Mira and Potable Aqua are a lightweight solution. Follow the directions on the package. Some contaminants are resistant to these treatments, so use caution. Also, be sure no one in your group has allergies to iodine before treating the group’s water supply. The taste left behind by chemical water treatment can be masked by flavoring, but only after it has been treated.
- **UV Light:** These lightweight devices are usually battery operated, so, bring extra batteries. They work quickly if you only need to treat one liter of water at a time, but, they are less effective in murky water.

Clearly, mark your water containers “clean-drinking” and “dirty-non-drinking,” and, don’t mix. If you use a gravity system, you’ll need a third type of jug or bag, “pre filtered,” to be used for no other purpose than hanging attached to the filter.

Estimating Water Needs: The average person under normal conditions is advised to drink eight glasses (half a gallon) of water per day. But a trail crew worker under moderate conditions drinks a gallon of water a day. Figure on even more if the weather is hot, and/or you are at elevation. If your camp is dry and you’ll need to import water, you’ll be especially concerned about having enough. A good starting estimate is that you’ll have enough for drinking, cooking, dishes, and the rare sponge bath at roughly 2.5 gallons per person per day.

Stoves: The type of cooking stove used will depend on the nature of the camp. Car-camping trips or trips supported by pack stock will likely use multiple burner stoves, while smaller, unsupported backcountry trips may share compact backpacking stoves. Whatever type, a good rule of thumb is one burner for every three people. Regardless of the stove used, it is crucial to become familiar with the stove’s function prior to a trip and to carry the parts and tools necessary to repair it in an emergency.

Locate stove on a level surface and protected from wind, using a windscreen if necessary. Keep away from vegetation and protect from sand and dirt. Avoid cooking inside a tent unless it’s extremely large and extremely well ventilated by big open doors and windows. Even then, keep the stove far away from the nylon. Set up the cooking space and supplies so that people can avoid needing to reach across a lit stove. Plan to have extra lighters and/or matches.

Estimating Fuel Needs: Depending on weather conditions and altitude, your fuel consumption will vary. If it’s cold, you’ll use more fuel for hot beverages and/or melting snow for water. At elevations above 5000 feet, cooking times will be drawn out, and more fuel will be consumed. A typical backpacking stove can range from 1/6 to 1/2 liter per person per day. When using small gas canister stoves, caution should prevail. Always carry an extra until you know precisely the stove’s fuel usage-duration. For larger

stoves, a good rule of thumb is, 20 pounds of propane should last two to three weeks for eight people.

Fires: Campfires are really more of a luxury than a necessity, and they can cause serious impacts, especially in dry climates and heavily used areas. Please consider not having a fire if you don't truly need it. If you're weighing your options, consider firewood availability (dead and down wood only), weather, and ecological conditions before using a fire. At a minimum, you must abide by current local fire restrictions, which go into place early in drought-affected areas.

If you choose to have a fire, use existing fire rings when available. When no fire ring is available, Leave No Trace practices must be employed. Bring along a fire pan, such as a metal trash can lid, which you can elevate with rocks to avoid scorching the earth. In sandy areas without mineral soil, a shallow pit fire can be created. When mineral soil is readily available (find it at the base of uprooted trees and around boulders); build a raised platform six to eight inches thick and two feet across and build a fire on top. Camouflage all constructed fire pits and platforms when finished. Regardless of the location, it is imperative to be sure a fire is completely out before leaving the fire. Ash should be cool enough to sift through your fingers.

Using a Fire for Baking/Cooking: If you are looking for taste of old-fashioned backwoods camping, it is possible to bake breads, cakes and many other camp treats in a **Dutch oven**. A Dutch oven is a thick-walled (usually cast iron) cooking pot with a tight fitting lid. After hot coals have been established, the dutch oven can be used. Spread the coals so the pot can sit flat upon them. Place hotter coals on top of the lid. Coals are the right temperature when they feel warm, but not burning hot, from a six inch distance. Check inside the pot as infrequently as possible for minimum heat loss.

Note that baking can also be done on the stovetop by making a small twig fire on top of a pot over a low burning flame. Flip, rotate or offset the pan to ensure even cooking.



Figure 3. Tarps shelter a backcountry kitchen and a gear storage area. The sump hole in the foreground is for waste water disposal. (IMAGE FROM LIGHTLY ON THE LAND.)

FOOD STORAGE AND SAFETY

Food Safety: Food borne illness can cause upset stomachs, vomiting, diarrhea and dehydration, all very serious in the field. More than one trail crew has been taken down by these symptoms. There are simple steps you can take to reduce risks of food borne illnesses.

- **Hands:** Handling food, handling serving spoons and knives, and plunging hands into bags of trail mix can spread germs like crazy, including Giardia and other intestinal bugs. To prevent illness in your group, have a strict rule that nobody touches anything in the kitchen without washing hands first. Wash hands often. For trail mix, pretzels, and chips pour out of the bag into your palm instead of reaching into the bag.
- **Surfaces:** Keeping clean is an ongoing challenge in field camps. Keep all food preparation surfaces wiped and sanitized. Cover food when not serving to keep dirt out. Be sure all dishes are washed thoroughly. Always use hot, soapy water.
- **Raw Foods:** Keep raw foods separate from precooked/prepared foods. Never store raw meat on top of other foods, as juices can leak. Consider a separate storage container. Use separate cutting boards and utensils for raw food. Bacteria can survive in undercooked foods. Heat foods thoroughly. Stir, rotate and boil foods completely. Use a food thermometer to ensure proper cooking.
- **Refrigeration:** Bacteria spread fastest at temperatures between 40 degrees and 140 degrees Fahrenheit. When you have perishable foods, serve immediately, and cold-store unused portions right away. Access to refrigeration varies greatly, and camp chefs must plan accordingly. In the high country, snow can be a viable option for keeping food cold. If using ice in coolers, keep in mind that big blocks outlast cubes. Good ways to extend cold storage include dry ice, frozen water jugs, and freezing other items such as milk, meats, soups, or sauces to act as “freezer packs.” If well wrapped and leak-proof, these freezer packs can be more effective and sanitary than loose ice cubes that get sloshy in the cooler. For a hot week on the trail, consider designating one cooler as “do not open until mid-week” and pack frozen foods inside with dry ice. Some backcountry cooks even cover coolers and bear boxes in space blankets during the day for extra insulation.

Critter-resistant Food Storage: Food will need to be protected from common critters. If bears are definitely not a problem in your area, then things will be a little easier, but, don't be fooled: a rodent or raccoon can destroy a food cache as efficiently as a bear. In all cases, keeping a clean camp is the first order of business. Dishes, stoves, and tables should be kept clean. Minimize food spills and garbage. The next order of business is secure storage. Never store food in tents! Anywhere food will be stored unattended, even when not in bear country, at a minimum you need to use secure containers.

Resists most critters:

- Vehicles (when car-camping)
- Storage lockers in developed campsites
- Clean garbage cans with tight-fitting lids
- Buckets with tight-fitting lids
- Large aluminum toolboxes
- Hard-sided panniers

Resists most critters including bears:

- Bear boxes (for larger crews)
- Bear canisters (for smaller, backpacking crews)
- Ur sacks (bear-resistant bags) for hanging food

Special Considerations for Bear Country: When camping and cooking in an area with a bear population, special precautions must be taken, and these precautions may vary regionally, so check with local experts.

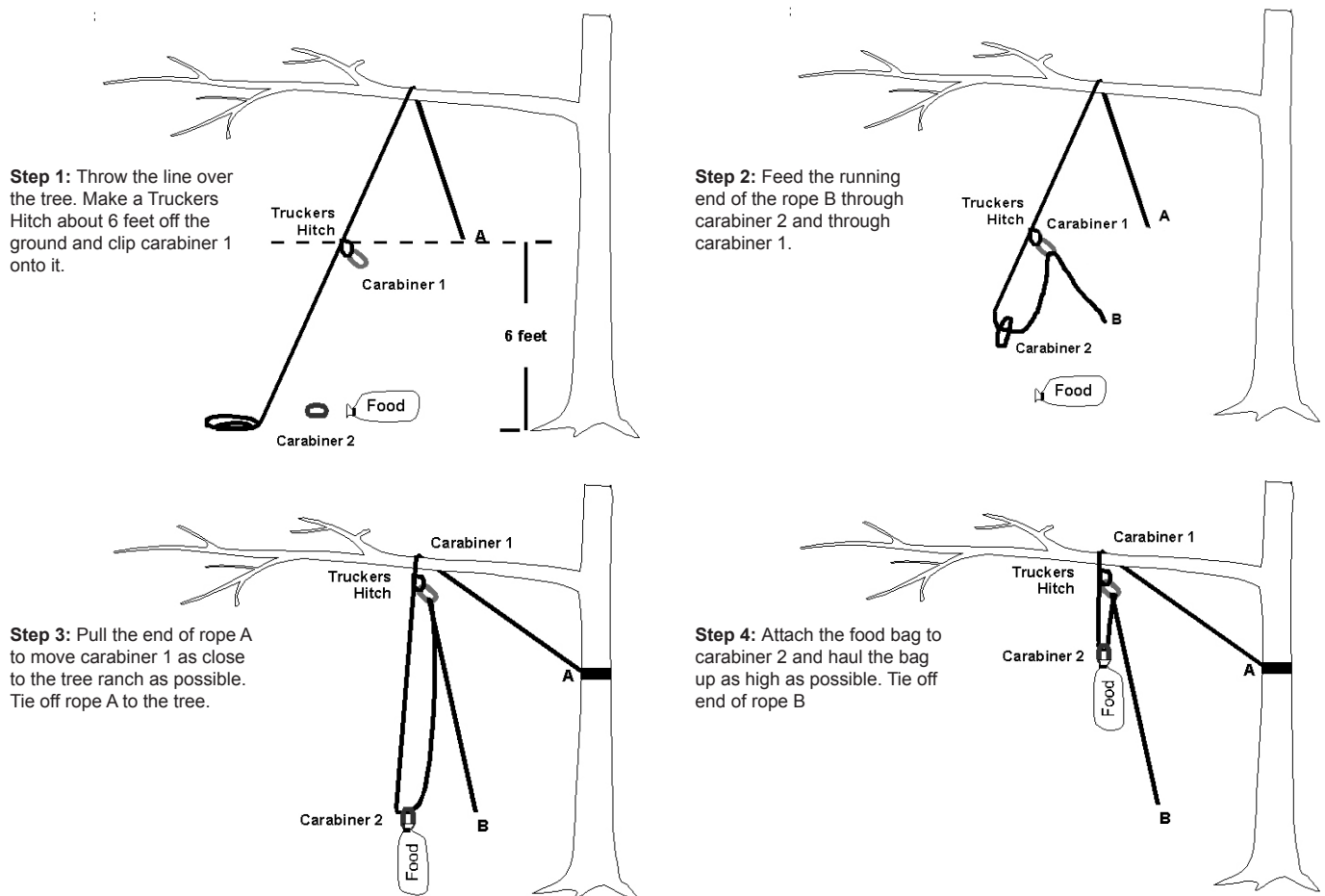
Again, be careful with spills and food scraps. Be especially careful to contain and pack out bacon grease and other cooking oils. Clothing and kitchen towels that smell of spilled food should be stored with your food. Food, garbage, and other smellables must be bear-proofed overnight and also during the day while food is unattended. In bear country, a vehicle won't protect your food from a bear that's learned to pry open windows and trunks. Of the containers listed above, the only ones that will work in bear country are the ones specifically designed to be bear resistant.

Bear boxes are great for groups. They are metal or thick plastic resin containers with bear-resistant closures, often designed as panniers for pack stock. Check with vendors who sell horse packing equipment. Bear boxes can be used for virtually anything; refrigeration, dry storage, garbage, toiletries. If bear boxes are unavailable, consider a **bear hang** or a bear line.

There are many different bear hang methods. But even the best method should only be considered a bear **delay tactic**, not prevention. Consider hanging a bell with your food bags to alert you to a bear's meddling. Make sure your intended campsite has trees substantial enough to accommodate a bear hang. Remember, several days' worth of crew food is very heavy! You might need to set up more than one hang. Don't underestimate how much time it can take to do this properly. Done properly, your food will dangle at least 12 feet off the ground, 6 feet below supporting limbs, and 6 feet from tree trunks.

If you need to protect a large amount of food for a longer time, while maintaining easy access to the food, consider a bear line. This is a more engineered, high-capacity system developed by the Student Conservation Association (SCA). More information on bear line systems can be found in SCA's *Lightly on the Land*.

Figure 4. This is one method for hanging food in bear country. Food should hang 12 feet off the ground when it's all done. Note illustration is not drawn to scale.



Washing Dishes (adapted from Leave No Trace in the Outdoors): Dishwashing begins before dinner ends by encouraging everyone to consume all of their food, down to the last bit of sauce and grain of rice. If there's a little left in the pot, every group generally has at least one "human garbage disposal" who can be coaxed into eating the rest. If there's a lot left, contain and store it.

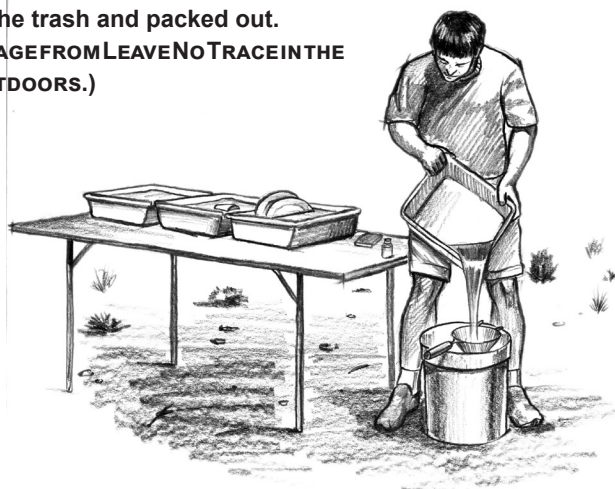
Most dishes can be cleaned with a little water, a few drops of soap, and a scouring pad. Sponges aren't the best because they can't remove burned food and they retain bacteria. Use unscented phosphate-free biodegradable soap, recognizing that even these soaps should never be used in water sources. Most soaps require six months to several years to biodegrade, so use them sparingly.

In smaller backpacking groups, you might choose to have individuals each wash their own dish without an elaborate system. For larger groups, you'll want to use the following system.

Four-Bin Wash System:

- **Before the Bins:** Clean plate club! Have everyone lick their plates, for every last drop of that scrumptious sauce. If people can't bring themselves to lick, use a rubber spatula or paper towels to get most of the stuff off. Food scraps and saucy paper towels can go in the compost if you are composting. Or, put them in the trash.
- **Bin 1:** Pre-wash, for getting any big chunks off and keeping other bins cleaner longer
- **Bin 2:** Hot, soapy water (replace as necessary)
- **Bin 3:** Sanitize. One method is to dip dishes in boiling water (such as the water used to prepare your next meal) for 30 seconds. Alternately, use bleach or other germ killing agent in cold water, 1.5 teaspoons per gallon. Typical plastic dish pans/tubs/bins hold three to four gallons when full. Keep dishes submerged for one full minute. Note: water over 115° F stops bleach from sanitizing, so, make sure your water is no hotter than what you'd want in a warm bath.
- **Bin 4:** Cold water rinse (only necessary if chemicals were used for sanitizing).

Figure 5. All particles strained from dishwater should be placed in the trash and packed out. (IMAGE FROM LEAVE NO TRACE IN THE OUTDOORS.)



After all dishes are washed, hang to dry in a mesh hammock or bag. A tin can with holes in the bottom will work for draining and storing clean silverware.

What to Do With Waste Water: Strain cooking water and dishwater through a piece of fiberglass screen or mesh strainer to remove any food particles and pack them out. Respect wildlife by preventing animals from obtaining any food waste, including small "micro-garbage."

When dumping dish bins, keep them clean and sterile by straining bin 1 first, then dumping the contents of bin 2 into bin 1, and so forth, until bin 1 contains the cold water rinse that was bin 4. Remember to strain the food particles each time.

Dispose of the strained cooking, dishwashing, and chemically treated sanitizing water in a sink or flush toilet if you're in a campground. Do not use pit or composting toilets (outhouses) to deposit dishwater as the food odors can attract animals that will damage the outhouse, and excess water slows or halts the decomposition of wastes.

In areas without washing facilities, carry strained liquids at least 100 feet (40 steps) away from any water sources or campsites to protect water quality and avoid attracting wildlife. A preferred disposal

method is to filter these liquids through a screen and scatter them widely by flinging it in a broad dispersing arc, known as “broadcasting.” Alternatively pour strained cooking or dishwashing water into the soil, preferably under some thick organic litter to mask smells. Avoid killing soil microorganisms by letting boiling water cool prior to disposal. Some crews dig sump holes for disposal of this water.

Managing Garbage: “Pack it in, pack it out.”

Leaving no Trace begins at home. Repackaging food and removing excess material cuts down on what is packed in, therefore also what is packed out. This is essential for packer supported projects, but useful at all times, to reduce garbage management. Buying bulk foods and cutting down on leftovers will also save waste.

Inevitably, some refuse will be generated. Separating food waste from other trash will help keep the waste less aromatic. Store garbage just as you would food, out of reach of animals. When you’re having camp fires, certain types of garbage can be acceptable under the right conditions, but avoid burning plastic as it releases toxic fumes. Never bury garbage, as animals will quickly dig it up.

Some crews will choose to compost in the field. Keep a separate bucket with a tight fitting lid for all food scraps, keeping them separate from the rest of the garbage. Be sure to have somewhere to take the compost after the trip. If you don’t have access to a home garden and compost heap, you can often ask at farmers markets or local health food stores.

WRAP UP

When you are breaking down camp, always leave it better than you found it. Have everyone spread out and hunt for micro trash, fill holes, and disguise paths.

Back at home, you’ll want to store and inventory unused non-perishable food. Don’t forget to report volunteer hours and file for reimbursements in a timely manner.

TEACHING TIPS & TECHNIQUES

Each student jot down some initial ideas for backcountry meals: three breakfasts, three lunches, and three dinners. Have them consider special dietary needs.

Have students complete the “Backcountry Nutrition Myths & Facts Quiz” (from *NOLS Backcountry Nutrition*) and review answers.

After considering all the menu planning factors, take another look at the ideas students jotted down at the beginning. Discuss which meals are suitable for the backcountry.

Have the group design a weeklong menu for a 12-person backcountry crew with a few restrictions. A couple vegetarians and a lactose-intolerant, for example. Utilize the Meal Planning template (from Appalachian Mountain Club).

Have the group write the shopping list for the menu designed. Utilize the Serving Size Guide (adapted from Florida Trail Association).

Go back to the gear packing list and compare it to the menu the group designed. Will the group have all the right stuff needed to cook and serve those meals? Is there anything that should be added or subtracted?

Pack, weigh, and balance panniers, hard-sided coolers, and cooler bags.

Look at the blank Trail Crew Chore Chart. Have students decide if there's anything they would add. Have a discussion about varying camp roles.

Have students experiment with different stoves to familiarize themselves with operation. Students can set up, take apart and troubleshoot the equipment.

Have students practice several methods of a bear hang. Use rope, bags, buckets, etc., and hang from various locations. Separate class into two groups and see who can successfully create a bear hang more quickly.

Get hands-on with the food and kitchen equipment by preparing an actual recipe together. This gives the students opportunities to practice sanitation and cooking skills. This is a great wrap-up exercise with the bonus of eating the finished product!

TRAIL FUN

For a fun wrap-up do a fast-paced "Jeopardy"-style quiz based on the KEY CONCEPTS.

REFERENCES

Leave No Trace in the Outdoors. 2014. Jeffrey Marion. Stackpole Books.

Lightly on the Land: The SCA Trail Building and Maintenance Manual. 2005. Robert Birkby. The Student Conservation Association and Mountaineers Books.

NOLS Backcountry Nutrition. 2008. Mary Howley Ryan.

NOLS Cookery. 1997. Claudia Pearson.